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AZERBAYDZHAN EXPERIMENTS IN EXPLOITING WATER-SATURATED PETROLEUM DEPOSITS

Working petroleum deposits in the Apsheron Peninsula over a long period of time has led to a flooding with water of many strata and horizons. Present exploitation of these strata and horizons does not produce a petroleum output within the range normal for such strata and horizons. The Surakhany petroleum deposit includes a number of such horizons: the podkirmakinskiy series in the northeast section, the nadkirmakinskiy sandy horizon in the lower section, and several horizons of the Balakhany and Sabunchi series.

An analysis of material on exploiting such deposits over a number of years leads to the conclusion that a steady increase in the amount of liquid removed from very watery strata is a necessary prerequisite to their normal exploitation. The Ordzhonikidzeneft', Kaganovichneft', Stalinneft', and Leninneft' trusts were the first in the Azneft' Association to adopt the forced method of removing liquid from very watery strata. Later this method was extended to other petroleum regions of the country.

In 1945 - 1946, on the basis of long, practical experimentation, Professor V. N. Shchelkachev substantiated scientifically a method for the forced removal of petroleum from watery strata and horizons.

In the initial period of the forced removal of liquid from very watery strata, the method was applied only to certain wells. This did not permit complete exploitation of the potential capacity of the stratum. Later, the oil fields of the Ordzhonikidzeneft' Trust began to use the forced method systematically and the method was adopted for entire strata and horizons.

Experience has shown that the forced method is very important for the petroleum industry since it contributes to an improvement in the exploitation coefficient of old petroleum horizons.

The bore-hole water extracted varies in quantity, having a tendency, as a rule, to increase from year to year. Investigations for a number of watery horizons of the Surakhany deposit indicated that the amount of water per ton of

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extracted petroleum increased in the past 5 years from 1.70 cubic meters to 5 cubic meters. Therefore, in setting up a method for exploiting wells from this deposit, the amount of liquid pumped out in a year must be increased 30-40 percent.

Ten years ago up to 250 cubic meters of liquid were removed each 24 hours from a well in the nadkirmakinskiy horizon and the petroleum content of the liquid was 10 percent. To obtain the same amount of petroleum at present, it is necessary to extract twice as much liquid. With this purpose a number of oil fields in the trust increased the diameter of the pipes through which the liquid was raised to the surface from $2\frac{1}{2}$ to 4 inches. Such a measure was adopted for wells from very watery horizon IX where some years ago the amount of liquid removed each 24 hours ranged between 150 and 180 cubic meters. To keep obtaining the same amount of petroleum from the extracted liquid as previously, the amount extracted had to be increased to 600 cubic meters each 24 hours for a number of wells.

In this connection, investigations carried out in working the podkirmakinskiy series of the north section of the southeast field of the Surakhany deposit may be regarded as characteristic of treatment of watery petroleum deposits. During the first period (1939 - 1940) of exploiting wells here, about 120 cubic meters of liquid were removed each 24 hours. Pipes $2\frac{1}{2}$ inches in diameter, through which the liquid was raised to the surface, were lowered to a depth of 800-1,000 meters. Counterpressure at the opening of the pipe was regulated by a sleeve 15 millimeters in diameter.

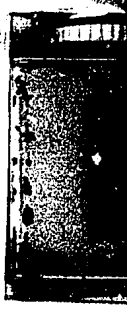
As the inflow of water into the deposit increased (1943 - 1944), it became necessary to increase the amount of liquid removed and to intensify the forced method of removal. This was achieved by an increase in the diameter of the sleeve and by increasing the depth to which the pipes were lowered. This was the second stage in the forced removal of liquid from a well in the north section.

In the third period (1945 - 1947), when all the technical possibilities for increasing the removal of liquid from the deposit seemed to be exhausted, and further lowering of the pipes through which the liquid reached the surface was limited by the working pressure of the compressors, compressors with a working pressure of 70 atmospheres were set up at a number of compressor stations. This made it possible to lower the pipes as much as 1,500-1,600 meters and the amount of liquid raised to the surface rose to 250-300 cubic meters per 24 hours.

A fourth stage of forced extraction is now being planned for wells in this section. The diameter of the pipes through which the liquid reaches the surface will be increased from $2\frac{1}{2}$ to 3 and then to 4 inches.

In 1946 - 1947, old SK-1100, SK-3, SK-6, SK-7 pumping jacks began to be replaced by heavy reducing-gear pumping jacks. This led to an increase in the wells' period of activity between repairs, improved the coefficient of exploitation of the wells, and intensified the forced removal of liquid from the watery deposit. By increasing the pumps and the depth to which they were lowered, as well as the frequency and length of the stroke, the output of each well increased an average of one ton /per day/.

The following stage of the forced method, in the case of wells in these oil fields, permitted an even greater removal of liquid, so that not only was the existing level of petroleum output maintained but in some wells it was increased from 1-1.5 tons. In these cases it was necessary to replace the lighter



reducing-gear SKN-5 pumping jack by the heavier SKN-6 and SKN-7 pumping jacks. Only this method does not seem efficient. The work of AzINMASH /Azerbaydzhan Institute for Petroleum Machinery/, planning an increased load on the pumping jacks by increasing the length of the stroke, deserves attention. For example, an excellent effect was achieved by installing in the SKN-6 pumping jacks the crankshaft of the SKN-7 with the length of the stroke 3 meters. This increased the length of the stroke 90 centimeters. This measure made it possible to obtain 2-3 extra tons of petroleum per day.

In oil fields of the Ordzhonikidzeneft' Trust, 74 wells are being exploited from watery horizons. These wells require additional forcing. However the SKN-5 pumping jacks in use at these wells are already overloaded and are operating at technical limits. Readapting them or replacing them with SKN-6 machines would not be expedient. Therefore, the adoption of the suggestion of workers of AzINMASH to increase the length of the stroke of pumping jacks of the standard series is very important both for intensifying the forced method of removing liquid from watery strata and for increasing the petroleum output.

Experience has shown that reducing-gear pumping jacks can operate for a long time normally and without interruption with an overload within the limits of 15-20 percent.

The forced method of exploiting watery strata and very watery horizons opens up tremendous reserves for increasing petroleum extraction.

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